

REMARKS

Claims 1-22 remain in this application. Claims 1-22 are rejected. Claim 7 is objected to. By way of this amendment, Claim 18 has been canceled and Claims 7 and 17 have been amended. The applicant submits the following remarks and hereby requests reconsideration of the rejections.

I. Claim Objections

The Examiner has objected to the limitation of “a desired residual stress pattern” contained in Claim 7. Claim 7 has been amended to read “The method of claim 1 further comprising the step of varying the amount of surface cold working to achieve a desired residual compressive stress.”

Claim 7 is now believed to be in proper form for allowance.

II. Claim Rejections – 35 USC § 102

Claims 1, 4 - 11, and 15 - 16 have been rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,688,419 (Offer). Applicant respectfully traverses these rejections in view of the present remarks.

The MPEP provides that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” MPEP 2131 (quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). The alleged prior art invention “must be shown in as complete detail as contained in the... claim.” MPEP 2131 (quoting *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Independent Claim 1 of the subject application contains the limitation of “performing a compression operation to induce a deep layer of compression in the surfaces of the workpiece.” Independent Claim 10 recites the limitation of “performing a compression operation to induce a layer of residual compressive stress along the regions.” The compression operation comprises using a compression tool, such as a burnishing ball or roller, to apply a force “against the surface of the workpiece **10, 12** and along the weld line **18** to produce a zone of deformation and to induce a deep layer of compression within the surface of the workpieces **10, 12**.” Application of Prevey, col. 4, paragraph [0056]; Fig. 3.

Applicant does not find any teaching in Offer of performing a compression operation where a compression tool, such as a burnishing ball or roller, is brought in contact with the surface of the workpiece to apply a force and thereby produce a zone of deformation and introduce a deep layer of compressive stress. Instead, Offer teaches a welding or heating operation resulting in a weld having lower tensile stress or, possibly, compressive stresses. Offer does not teach performing a compression operation for specifically inducing a deep layer of compression in the workpiece through the application of force. Because Offer does not teach each limitation of Claims 1 and 10 the rejection should be withdrawn.

Claims 4-9, which depend from Claim 1, and Claims 11 and 15 - 16, which depend from Claim 10, are believed to be in condition for allowance for the reasons stated above.

Further, with regard to Claims 4 and 15, applicant does not find any teaching in Offer, express or inherent, of performing a burnishing operation to control the residual stress pattern in the workpiece. The Examiner's characterization of the process in Offer as "rubbing" or burnishing is not well received. As noted above, the burnishing process disclosed in the subject application comprises forcing a burnishing ball or roller against the surface of the workpiece to form a zone of deformation and to induce residual compressive stresses in the surface of the workpiece. Application of Prevey, col. 4, paragraph [0056]; Fig. 3. This is fundamentally and patentably distinct from the teachings of Offer. Offer discloses oscillating a torch over the workpiece to "spread the heat on the far surface of the pipe." Offer, col. 10, lines 65 – 67. Offer does not teach that the torch contacts or is forced against the surface of the workpiece to cause deformation thereby inducing residual compressive stress. Offer only teaches that the torch is used to heat the workpiece. Accordingly it is submitted that Offer does not teach each limitation of Claims 4 and 15 of the subject application and should be withdrawn.

Further, with regard to Claim 5, Offer does not expressly or inherently teach, nor does the Examiner argue, the limitation of "a desired compressive stress pattern having a selected amount of cold working and surface hardening" as is recited in Claim 5 of the subject application. The rejection of Claim 5 should therefore be withdrawn.

Claims 1, 11, 17, and 22 have been rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,201,458 (Hagen). Applicant respectfully traverses these rejections in view of the present remarks.

Independent Claim 1 of the subject application contains the limitation of “performing a compression operation to induce a deep layer of compression in the surfaces of the workpiece.” Independent Claim 10, from which Claim 11 depends, recites the limitation of “performing a compression operation to induce a layer of residual compressive stress along the regions.” Independent Claim 17 contains the limitation of a “means for inducing a deep layer of compression within the surface of the workpiece.”

Hagen does not teach or suggest performing a compression operation for inducing a deep layer of compression within the surface of the workpiece as is taught in the current application. The primary purpose of the invention in Hagen is to relieve tensile stresses in weld material so as to alleviate distortion in the welded component. Hagen, col. 3, lines 12-17; col. 3, lines 24-31. Indeed, Hagen actually teaches that compression and compressive stresses are undesirable stating “[c]are should be taken so that the force applied by the hammer 72 **does not cause compressive stresses** in the suspension material.” Hagen, col. 8, lines 9-11 (emphasis added). Accordingly it is submitted that Hagen does not teach, either expressly or impliedly, each and every element of Claims 1, 10 and 17 of the subject application. Therefore, it is requested that the rejection be withdrawn.

Based on the foregoing remarks, it is believed that Claim 11, which depends from Claim 10, and Claim 22, which depends from Claim 17, are in proper condition for allowance.

Claims 1 - 8, 17, 19, 20, and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,926,970 (James et al.) Applicant respectfully traverses these rejections in view of the present remarks.

The subject application teaches performing a compression operation, specifically a burnishing operation, at elevated temperatures. Indeed, Claim 1 requires that the "compression operation is performed along the weld line and regions *having elevated surface temperatures*." Application of Prevey, Claim 1 (emphasis added). This limitation is not found in the James et al. reference. The purpose of performing the compression operation at elevated temperatures is to produce a deeper compressive layer than can be obtained by performing the burnishing operation at room temperature. Application of Prevey, p. 4, paragraph [0060].

In comparison, James et al. teaches a method of forming a weld joint with improved physical properties by introducing compressive residual stresses in the weld joint. James et al. does not teach that the compressive residual stresses are induced in the weld joint while the material of the weld joint is at elevated temperatures so as to produce deeper compressive residual stresses. Nor does James et al. teach that there would be any benefit in inducing compressive residual stresses at elevated temperatures. Accordingly, it is submitted that

James et al. does not teach every limitation of Claim 1 of the subject application and the rejection should be withdrawn.

Based on the foregoing remarks it is believed that Claims 2 - 8 that depend from Claim 1 are in proper condition for allowance.

Claim 17 has been amended to contain the limitation "means for creating a surface temperature gradient within regions of the workpieces." The Examiner has previously acknowledged that "James et al. does not expressly teach creating a temperature gradient within a region of the workpiece." Accordingly, it is respectfully submitted that Claim 17, as amended, is patentably distinguishable over James et al. and the rejection should be withdrawn.

It is believed that Claims 19, 20, and 22, all of which depend from Claim 17, are in proper condition for allowance.

It is also submitted Claim 17 is patentable over the combination of James et al. and Yoshida et al. for the reasons discussed below.

III. Claim Rejections – 35 USC § 103

Claims 9, 10 - 16, 18, and 21 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,926,970 (James et al.) in view of U.S. Patent 4,588,869 (Yoshida et al.) Applicant respectfully traverses these rejections in view of the present remarks.

Three criteria must be met in order to establish a prima facie case of obviousness under 35 U.S.C. 103(a):

- i. Some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of

ordinary skill in the art, to modify the reference or to combine reference teachings; and

ii. A reasonable expectation of success; and

iii. The prior art reference (or references when combined) must teach or suggest all the claim limitations.

MPEP 2143. The applicant respectfully submits that the Examiner has not established a prima facie case of obviousness with respect to each claim rejected under 35 U.S.C. 103(a).

Neither James et al. or Yoshida et al. contain any suggestion or motivation to modify the references or combine the reference teachings. James et al. discloses a method of improving the fatigue and stress corrosion properties of a weld by introducing compressive residual stress in the weld joint by burnishing. As the Examiner has acknowledged, James et al. does not teach or suggest creating a temperature gradient within a region of the workpiece or the use of a coolant to cool a region of the workpiece. Nor does James et al. teach or suggest that either limitation would be useful in improving the fatigue or stress corrosion properties of a weld joint or providing deeper compressive residual stresses.

Yoshida et al. discloses a method of reducing tensile stresses in a welded pipe through the use of localized heating/cooling to cause expansion and contraction thereby creating compressive residual stresses in the metal. Yoshida et al. does not teach or suggest the use of burnishing or any other mechanical method for introducing compressive residual stresses.

The processes by which Yoshida et al. and James et al. introduce compressive residual stress in the component are **fundamentally distinct**. It would not have been obvious to one skilled in the art to combine such distinct processes to induce deeper compressive residual stresses in a workpiece than can otherwise be achieved without the combination. Accordingly, neither Yoshida et al. or James et al. contain any suggestion or motivation to combine reference teachings and the Examiner has not provided any other rationale to support the combination. Therefore, the Examiner has failed to establish a prima facie case of obviousness.

Further, James et al. teaches away from Yoshida et al. As noted hereinabove, Yoshida et al. teaches the use of localized heating/cooling to induce a compressive residual stress in a weld joint. However, James et al. discloses that this type of localized heating to introduce residual stresses "can result in distortion and increase tensile residual stresses elsewhere in the workpiece." James et al., col 2 lines 55-56. Both conditions are highly undesirable. Therefore, James et al. teaches away from the use of localized heating as disclosed in Yoshida et al. Accordingly, based on the teachings of James et al., one skilled in the art at the time the subject invention was made would not have found it obvious to combine the teachings of James et al. with the teachings of Yoshida et al.

Absent a suggestion or motivation to combine, James et al. and Yoshida et al. do not render Claims 9, 10 - 16, 18, and 21 unpatentable.

In view of the foregoing Remarks, Applicant respectfully requests reconsideration of the Application and that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "Mark F. Smith", with a stylized flourish at the end.

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